

YUBA

12-20
INSTRUCTION
BOOK

Instruction Book for

I2-20

The Yuba Ball Tread
Tractor

L. S. PRIOR, JR.
LT. COMDR., A-V(S), USNR
ENGINE OVERHAUL OFFICER

ITS OPERATION AND CARE

No matter how carefully a manufacturer may build a piece of machinery, no matter what precautions he may take to prevent excessive wear and tear upon vital parts, the life of that machine depends absolutely upon the care taken of it by the owner and operator.

The careless, slovenly operator is capable of wrecking the best piece of machinery ever built, in a very short time. Bear these facts in mind while reading this text, now, and as long as you operate a **Yuba Ball Tread Tractor** or any other machine.

In designing and building **The Yuba Ball Tread Tractor**, the engineers of the **Yuba Manufacturing Company** have exercised every precaution, not only in selecting materials and building the machine, but in protecting each part against friction, with its attendant wear and cost.

But these precautions lose their value unless the operator takes proper care of the tractor while it is in his hands.

The Yuba Ball Tread Tractor is rated to do a certain amount of work at a certain speed. Knowing the amount of work twelve horses can do under certain conditions, give the Model 12/20 the same load. Don't overload it, and don't operate it at a higher speed than it is rated for. It will handle a bigger load and go faster than we specify, but continued overloading and continued traveling, at an excess speed, reduce the life of the tractor and increase the number and cost of repairs. All our ratings are very conservative. A generous margin of safety is allowed. These conservative ratings, and the generous margin of safety, are the factors responsible for the low cost of upkeep on **The Yuba Ball Tread Tractor**.

The most important subject dealt with in this book, is that of lubrication. Friction is the biggest power leak known to machinery. To reduce it to a minimum, **The Yuba Ball Tread Tractor** is equipped with high-duty roller-bearings and ball-bearings, instead of the usual bronze or babbitt bearings. Cut gears of high-grade steel, having a special tooth shape, aid in reducing the loss of power still further. In order to work to maximum advantage, the bearings, gears, motor and track, require a sufficient supply of the proper lubricant.

After careful study of the matter, we have compiled the accompanying data regarding lubricants. We recommend that our advice be carefully followed in this matter, and that you do not allow yourself to be deluded into thinking that cheaper and lower grade oils and greases will be just as good. They emphatically will not.

It is a very good plan for the operator to cultivate the habit of spending a few minutes each morning in an inspection of the lubrication system, to determine whether all parts

have the necessary amounts of oil or grease. Such a habit pays well.

Adjustments should be made carefully, and as soon as the necessity for them is noticed. Otherwise they have a habit of developing into expensive repairs.

The Yuba Ball Tread Tractor is so constructed that practically any part can be replaced in the field by the operator, with assurance that the parts will be aligned to 1-1000 of an inch.

It is a good investment to prepare some kind of shelter for protecting the tractor from rust, due to rain and dew. If you have an automobile, there is little danger of our being wrong in saying you take great care to keep it protected from the elements, and in a spick-and-span condition. By remembering the tractor is a modified automobile and represents a financial investment of fair size, you will see the logic of giving it the same care.

The **Yuba Manufacturing Company** has designed a **Tracover** and will be glad to furnish a folder showing plans and giving bill of material.

GENERAL OPERATION AND CARE OF TRACTOR STARTING

1. Look tractor over before starting.
2. See that transmission grease is up to proper level.
3. See that all grease cups have been screwed down and refilled.
4. See that track oil pots are full and properly feeding.
5. See that the radiator is full of water.
6. See that fuel tanks are full and fuel is flowing to carburetor properly.
7. See that there is plenty of oil in motor.

8. Be sure transmission gears are in neutral.
9. Never spin motor.
10. Motor speed is 700 R.P.M.

In very cold weather it is necessary to prime motor with gasoline. Where Ensign Carburetor is used, use priming tank on back fuel tank, and if necessary, use priming cocks on top of motor.

In warm weather it is very easy to get too rich a mixture for starting. Don't use too much gasoline when priming.

SHIFTING GEAR

The gear shift is of the automobile type, the clutch must be disengaged and gears shifted in same manner, except that it is impossible to shift from one speed to another without stopping tractor.

In disengaging clutch, don't use too much force, press clutch out easily.

FUEL

Gasoline or one of the heavier fuels lying between gasoline and kerosene referred to in this book as "Distillate" should be used as fuel. If kerosene or an equally heavy fuel is used, special carburetor equipment is necessary.

When the tank is being filled, the distillate should be strained through chamois, in order to remove water and other impurities.

LUBRICATION CYLINDERS

Only the best grades of heavy motor cylinder oil should be used. We may mention "Mobile B," "Standard Gas Engine Oil," "Motoreze," extra heavy, as suitable for summer use. For winter, use a lighter grade.

Be sure the float on the crank case indicates a high oil level at all times.

TRANSMISSION

The transmission case should be kept filled to a level of center of counter shaft. (Use Monogram fibre gear case grease or Union Transmission grease-light, or any other good transmission grease of the same quality.) It takes about 100 lbs. to fill the case.

When the machine leaves our shops, the transmission case is filled to proper level with suitable mixture.

Whenever the top is removed from case, great care should be taken that no dirt finds its way into the parts.

The transmission should be cleaned and re-filled at least once a year.

MAGNETO

Magneto should be oiled with a light grade oil (3 in 1 or oil of the same grade). Use two drops in each oil hole once every thirty working hours.

TRACKS

The reservoir of the track should be kept filled with heavy fuel oil, or a good heavy lubricating oil, such as "Summer Black" or "Standard Green Skid Oil" for the lubrication of the balls, tread links and pin.

This is the only means of lubricating the track parts and bull pinion, and requires careful attention.

GREASE CUPS

The grease cups should be kept filled with a good grade cup grease. The following is a list and location of grease cups:

Four on each ball race.

One on front wheel.

One on front wheel circle.

One on each steering chain sheave.

Two on steering post.

One on drive pulley.

One on clutch,

One on clutch yoke.

Two on motor water pump.

To grease the outboard bearings, on drive shaft, remove pipe plug and force grease in the bearings with a grease gun.

Note.—If the best qualities of lubricating materials are used, without exception, it will be found that the cost of lubrication is materially reduced. Cheap oils and greases are more expensive, in the long run, as the quantity necessary for the proper lubrication of the machine is considerably in excess of that where only the best oils are used.

CARE OF MOTOR

ELIMINATION OF CARBON

At least twice a week steps should be taken to clear the cylinders and rings from carbon.

To do this, feed a pint of kerosene, with a priming can, in at top of auxiliary air valve, where it will be drawn through the carburetor into motor. This should be done when the motor is warm and running up to usual speed on distillate. Then the motor should be shut off and turned over on quarter, or until all pistons are at approximately even height. Remove the spark plugs and put about a tablespoonful of kerosene in each of the cylinders letting the engine stand in this condition over night.

Before replacing the spark plugs they should be thoroughly cleaned and inspected, to see that the spark gap is about 1-32 inch.

The motor must be thoroughly lubricated,

kept free from dirt, and protected under all conditions, if it is to give the best service.

VALVE GRINDING

After the motor has run a week it is advisable to remove the port plugs, and seat the valves in on the carbon. This is done by turning motor over, by hand, until each valve is successively on its seat. Each valve should be raised slightly off its seat by a screw-driver under the valve stem, and the seat oiled with cylinder oil. The valve should then be turned slightly back and forth, and gradually worked around, as in the grinding operation. This is all that is necessary until noticeable leaks should appear. In this process use no grinding compound.

As often as the appearance of such leaks may necessitate, the valve springs should be removed, the carbon scraped from the valve chamber, and the valves reground. This is done by applying any good valve grinding compound (such as "Clover Brand") to the valve seat. Replace the valve, turn it slightly back and forth, and gradually work in this way around the circumference of the valve.

Do not revolve the valve continuously in one direction, as this is likely to score slight grooves in the surface of the seat.

From time to time during operation, the valves should be raised off their seat and a drop or two of very light lubricant or kerosene applied to the seat. This operation should be continued until both valve and seat show a perfect fit.

Only when the valve is very pitted should any but the finest grade of compound be used. When the coarse grade is used always finish carefully with the fine.

After very thoroughly cleaning the valve,

seat and chamber of any compound, apply a small amount of oil and seat the valve in place. This oil glazes the surface and prevents any cutting after motor is put into operation.

VALVE ADJUSTMENTS

After each operation of valve grinding, valves should be properly timed and adjusted. This can be done by turning the motor by hand to a point where each valve is successively seated. Then adjust the space between valve tappet and valve stem to 6-1000 inch—about the thickness of a calling card. A gauge is provided for this purpose. The fly-wheel is marked to show when valves should open and close.

ADJUSTMENT OF MOTOR BEARINGS

Attention should be paid on starting every morning to determine whether there is any knock in motor bearings. Such a knock, when present, can best be detected by putting the transmission gears in neutral position, running slowly, and shorting one spark plug at a time; listening for knock at that cylinder. In case a knock is found, the crank case should be removed at once and adjustments made.

At least once each month of continuous operation, the crank-case should be removed for general inspection and thoroughly cleaned. Before removing crank-case drain off all oil.

To adjust connecting rod bearings, loosen the connecting rod caps and remove one, or more, if necessary, of the thin liners which are provided for this purpose, care being taken not to bind the bearings. This can better be done while the bearings are dry or free from oil, BUT, after adjustment is completely made, remove the cap and thoroughly oil each bearing before final assembly.

After adjusting each bearing it is well to loosen them until all are adjusted, then tighten all thoroughly. By this means the slightest binding can be detected.

In replacing connecting rod bearing caps the greatest of care must be exercised that the cap is replaced in the same position, exactly as it was taken off. The bolts **MUST** be thoroughly tightened. After the connecting rod bolts are in place they should be wired with soft iron wire to absolutely lock them.

The crank-shaft bearings should be taken up in a similar manner when necessary.

VALVE TIMING

1. Be sure No. 1 Intake and exhaust valves have proper clearance (see valve adjustment).
 2. Turn motor over in the direction it runs until pointer over fly-wheel is on mark reading "Ex-C1 1-4."
 3. Turn cam shaft in the direction it runs, until No. 1 exhaust valve has just closed.
 4. Bolt on cam gear.
 5. Test out work, and if Intake valve opens too late change cam gear to make exhaust valve close sooner, but be careful not to get it too close before dead center.
- The Firing order on the Waukesha is 1-2-4-3.

CARE AND ADJUSTMENT OF CARBURETOR

Look for other causes than carburetor adjustment first, if the operation of motor becomes unsatisfactory.

Water in the distillate will cause sputtering and irregular shooting or loss of power in the motor. The water should be drained off at the cocks on the carburetor. Water can be detected as large globules at the bottom of a

vessel of distillate as it will not mix with the distillate.

Dirt may collect at the screen under the float chamber. The screen should be removed and cleaned. The fuel pipe, from tank to carburetor, may become clogged with foreign matter. This pipe should be disconnected at the unions and blown out clean. Even water may stop the flow of fuel in the fuel pipe. All distillate must be strained through a chamois skin before putting it into the fuel tanks.

For special adjustments see Carburetor Instruction Book.

CARE OF MAGNETO

The magneto requires very little attention aside from lubrication and keeping the points properly adjusted. A small wrench is provided for setting points with a gauge on the handle of the wrench for determining the distance that the points should be separated at the fullest break. The points should also be kept clean and smooth. Keep brushes clean and oil drain holes opened. (See Bosch catalog.)

NEWTON AUTOMATIC SPARK ADVANCE COUPLING

Should be flushed out with kerosene every week or even daily if conditions are very dusty, to wash out the dirt and prevent it sticking.

TO SET MAGNETO

Turn motor over in direction it runs until No. 1 Intake valve has just closed. Keep on turning until fly-wheel pointer shows $1\frac{1}{2}$ " before 1-4-D.C. mark; motor is now ready to fire on No. 1 cylinder.

Remove distributor and breaker box cover.

Turn magneto over in direction it runs, as indicated by arrow on front oil cup cover, until breaker points just start to open. Bolt magneto to pump shaft flange. Note which terminal the distributor brush is standing on. Use this for No. 1 and wire magneto to spark plugs in firing order of motor, this motor fires 1-2-4-3. Replace distributor and breaker box cover.

CARE OF OIL IN MOTOR

Oil should be kept high at all times and should be drained out of oil pan once every week and new oil supplied. At same time clean oil screens. By changing once a week, the oil will be clean and bearings stand up longer.

The oil pan should be removed every thirty days and cleaned out with distillate. At this time all bearings should be taken up and all bolts, etc., inspected.

Watch the oil pump tell-tale indicator at all times. If it does not work, find out, and remedy the trouble at once, otherwise you may burn up the motor.

Motor should be examined for knocks every day and repairs made at once. Never run your motor when it is pounding.

FAN BELT

Fan belt should not be tightened until motor has warmed up, otherwise it will be too tight and wear out quickly. The belt should be kept soft with **Neatsfoot Oil**.

RADIATOR

Wash dirt out of radiator inside and outside whenever necessary; if radiator fills up with dirt it causes motor to run hot. Always use clean, soft water; it lengthens the life of radiator and keeps scale from forming in cylinders. Caution should be taken in the use of

any compounds for either purifying water or stopping leaks.

AIR CLEANER

See that air cleaner is connected with carburetor at all times. It keeps the dirt out and saves cylinder wear. Also, with the low-grade fuel now in general use, it is very necessary to have all the hot air to carburetor possible.

BALL RACES AND TREADS

The oiling of the treads is explained under lubrication.

The spring at forward end of track is for the purpose of keeping a certain tension on the chain at all times. This spring should be kept fairly tight, that is, it should be compressed by tightening the adjusting nut, until the space between coils is about $\frac{1}{8}$ " or a little less.

The telescope portion, at front end of ball race, provides for enough adjustment to allow for the removing of one section of track. This should be done as soon as there is a space of about $4\frac{1}{2}$ inches at the telescope portion of the race.

TO REMOVE TREAD

It is necessary to remove guards and floor board over fly-wheel in order to have room to drive out pin.

Then loosen the spring tension adjusting nut to its fullest extent.

Then fasten track to the upper front curved portion of the ball race, by putting chain clear around both at point just back of the upright. Drive ahead slightly to take slack out of track; then drive out pin. Pins drive out from right to left.

As the pins drive out through hole at top end of front section of ball race, it is necessary to chain track so that pin to be removed will be opposite this hole.

After track is disconnected use a bar and raise loose end of track out of ball race. Drive out pin and remove one tread. It is necessary to work balls out from under tread first, before lifting out of ball race.

To couple track together—have front of track chained to ball race, opposite hole in ball race. Then drive slowly ahead until track comes together. Drive in pin, driving it from left to right.

Remove chain around track and race.

TO REMOVE TRACK

Remove pins as described above. Then run tractor ahead, under own power, until front end of track drops off ball race, at bottom of front section of race.

Reverse tractor until rear end of track leaves sprocket.

Lock this side with brake and run tractor off track, using opposite track for power.

TO REPLACE TRACK

Run tractor over track until there is sufficient track to throw over sprocket. Chain front end to ball races and connect up track. Run in balls as explained in following paragraphs.

TO REMOVE BALLS FROM RACE

Disconnect track and remove treads. (See above paragraph.)

In place of the tread removed, place in false link (this comes with tool equipment of tractor) and connect up track.

Run tractor ahead until false link comes on bottom. Then back and forth until balls are out. It is often better to block tractor up so tracks are clear off ground.

TO REPLACE BALLS IN RACE

This can be done by placing wooden block between top of spring yoke and ball race, jacking up tractor on same side until track is off the ground.

Tighten up spring tension adjusting nut, until track is close enough to bottom of ball race, so the balls won't drop out. Then run track back and forth, on top of ball race, dropping balls into race through track at false link; as the balls tighten up track, slacken up on spring tension adjusting nut.

When all the balls are in connect up track.

Where a jack is not used, the same results can be attained by moving tractor back and forth on the ground.

TO REMOVE BALL RACES

Jack up back end of tractor. Remove outside roller guide to ball race.

Remove the track bearings, then take a bar, force ball race back and at same time force track supporting spring from under yoke, until ball race will clear bull pinion. Races can now be moved sideways.

TO REPLACE BALL RACES

It is first necessary to use a clamp to compress track supporting spring, then slide races ahead into place and remove clamp. (These clamps can be obtained from Y. M. Co.) Replace roller guide and track bearing.

TRANSMISSION

The brake bands, on differential, can be adjusted by removing transmission case cover.

Care should be used not to get bands too tight. Make them just tight enough to hold differential, otherwise they will drag on drum, causing extra wear and loss of power.

TO TIGHTEN CLUTCH

Shove clutch out and block it by placing a piece of hard wood or iron about $\frac{7}{8}$ " wide between clutch yoke and flange.

Then slack up the two cap screws and move them toward the right, along the two slots until clutch is tight; then retighten. If clutch still won't hold, and screws are at end of slots, remove screws and place them in holes at opposite end of slots. There are three such holes in clutch so this adjustment can be made three times before it is necessary to replace clutch discs.

The clutch can be gotten at by either removing floor boards or through hand hole plate in right dust shield or from underneath the tractor.

TO USE TRACTOR AS STATIONARY PLANT

When it is required to use the motor for stationary work, the Round Starting nut screwed on the end of the tail shaft must be removed. This nut has left-hand threads and unscrews the opposite direction from a standard right-hand threaded nut.

Next, drive the flange off the shaft and place flange hub in pulley taking care that the head of the lock screw in the web of pulley comes right to engage the notch provided in the hub flange. Replace flange hub and pulley using

the feather key and same starting nut to lock pulley and hub in place.

If it is desired to let the pulley "idle," the lock screw can be disengaged. Constant "idling" of the pulley is advised against.

FRAME BOLTS, ETC.

All bolts should be gone over and tightened up every few days, especially while tractor is new.

It is vitally important that the cap screws in the flexible coupling, between motor and transmission drive shaft, be kept cinched up good and tight at all times.

Keep tractor clean; removing dirt and mud from tracks; leaves, straw or chaff from radiator; grease and dirt from motor.

Do not overload tractor. Remember that a traction engine, though it has a certain reserve power, cannot develop the overload for short periods that is possible for a horse to do.

Do not allow any bearings to get dry.

Use clean water, good oils and good fuel.

Operate and care for your tractor as carefully as you do your high-class automobile.

Build and use a tracover.

Book No. 1308

Furnished San Jose T. & T. Co.

Date 10-14-18

Yuba Manufacturing Company

433 California Street, San Francisco

*Factories: Marysville and Benicia
California*

L. S. PRIKE, JR.
LT. COMDR., A-V(S), USNR
ENGINE OVERHAUL OFFICER



